

Nuclear and Particle Physics Directorate Strategic Planning Retreat

Detector Projects

Ed O'Brien, Maria Chamizo Llatas, Jon Kotcher

June 9, 2017

70 YEARS OF
DISCOVERY

A CENTURY OF SERVICE



Overview: Detector Projects

All NPP Detector Projects require managing effort at other institutions at national/international level

Project	Scope	\$M	CD	Funding
ATLAS Phase I	Upgrade of Muon, Trigger/DAQ, Liquid Argon calorimeter	45	CD-3	DOE OHEP + NSF
ATLAS High Luminosity LHC	Upgrade of Pixels, Strips, Mechanics, Liquid Argon, Tile, Muon, DAQ, Trigger	230	CD-0	DOE OHEP+NSF
sPHENIX	Upgrade of Tracking, Electromagnetic/Hadronic calorimeter/Triger/DaQ	29-35	CD-0	DOE NP
*LSST	Construction of 22 Science Rafts	~24	CD-3	DOE OHEP
*DUNE	Cold Electronics/Field Cage/International Project Office	8 in FY17	CD-3	DOE OHEP+international
STAR-iTPC	Upgrade of TPC	3.6		DOE NP

* Sub-projects managed by other labs



BROOKHAVEN
NATIONAL LABORATORY

70 YEARS OF
DISCOVERY
A CENTURY OF SERVICE

Internal strengths

- BNL NPP has extensive expertise on design, construction, commissioning, and operation of large scale detectors for High Energy Physics, Nuclear Physics, Neutrino Physics and Cosmology
 - Development of cutting edge technologies on Calorimetry, Tracking, Silicon, Particle ID devices
 - Highly skilled teams of electronics & mechanical engineers that contribute to the trigger, readout, data acquisition systems and mechanics of large scale detectors
 - Long successful track-record on construction and operation of physics experiments
- Infrastructures for test equipment, cleanrooms, detector and electronics labs, machine shops, radiation testing facilities
- Long history of lab support of these activities via G&A, PD, LDRD...
- Impressive collaborative effort between the NPP detector projects and the BNL instrumentation division.

Internal weaknesses

- Lack of a succession plan for highly skilled personnel
- Potential loss of unique laboratory capabilities such as the Instrumentation Division crucial for BNL projects to succeed
- Weak support for users and visiting scientists and poor access to students.
- Insufficient lab-wide Project support, development of collaborative tools, lack of share of knowledge, high cost
- DUNE and LSST are managed by other labs (FNAL and SLAC) and have no direct control of the use of contingency that may be needed for the BNL contribution to succeed

External Opportunities

- Upgrade of sPHENIX provides a unique capability to attract external partners during the R&D phase and construction and to lay the path towards a significant role in a future electron-ion collider detector
- Neutrinos and High Energy Physics Projects participate successfully in non-BNL based experiments with a large international component. R&D for new detectors at the intensity and energy frontier are excellent mean to develop world-wide cutting edge technologies using in-house expertise
- For 20 years BNL NP-detector projects were quite naturally focused on RHIC. However it would be in BNL-NP's interest to start to participate in projects outside of BNL. Fundamental symmetries (nEXO, Majorana, various EDMs), JLab, GSI-CB
- Leverage detector expertise obtained by the LSST Science Raft team to secure private and other astronomical projects in the DOE complex.

External Threats

- Funding constraints affect the capability to retain key personnel, loss of unique laboratory capabilities, retaining critical mass of technical staff
- Budget limitations impact the R&D and technological choices for detectors projects to be competitive world-wide and to retain and attract skilled personnel and impacts the BNL contribution at national and international level
- Without a diverse portfolio for nuclear physics experimental activities both inside and outside the lab, an unanticipated budget shortfall, early facility closure, or significant delay in new initiatives could put us in a position of having no contingency plan and a long lead time required to change directions. Extremely important to diversifying our projects beyond those that are BNL-based.

Goals

- Together with NPP directorate define a roadmap aligned with the physics drivers of the P5 and NSAC Long Range plan to identify outside research programs that would further develop the scientific, technological and leadership capabilities of the laboratory
- Define achievable plans that exploit the U.S. strengths and BNL technical capabilities to optimally contribute to the intensity, energy and cosmic frontier.
- Deliver on the scope to which we commit, on schedule and budget

Issues

- Funding uncertainties might significantly influence future plans
- This needs to be assessed realistically, in the context of both the laboratory's future and the broader HEP/NP effort in the U.S. and beyond.
- Introducing flexibility into our project and program plans will facilitate some adaptability, which will serve us well as the situation evolves.
- Risk Mitigation in our BNL-NP strategic plan should lead to a diversification of the NP science program beyond BNL-based projects.